What is claimed is:

1. A polyolefin, which contains about 80 to about 150 branches per 1000 methylene groups, and which contains for every 100 branches that are methyl, about 30 to about 90 ethyl branches, about 4 to about 20 propyl branches, about 15 to about 50 butyl branches, about 3 to about 15 amyl branches, and about 30 to about 140 hexyl or longer branches.

2. The polyolefin as recited in claim 1 which contains about 100 to about 130 branches per 1000 methylene groups, and which contains for every 100 branches that are methyl, about 50 to about 75 ethyl branches, about 5 to about 15 propyl branches, about 24 to about 40 butyl branches, about 5 to about 10 amyl branches, and about 65 to about 120 hexyl or longer branches.

3. The polyolefin as recited in claim 1 which is an ethylene homopolymer.

4. A polyolefin which contains about 20 to about 150 branches per 1000 methylene groups, and which contains for every 100 branches that are methyl, about 4 to about 20 ethyl branches, about 1 to about 12 propyl branches, about 1 to about 12 butyl branches, about 1 to about 10 amyl branches, and 0 to about 20 hexyl or longer branches.

5. The polyolefin as recited in claim 4 which contains about 40 to about 100 branches per 1000 methylene groups, and which contains for every 100 branches that are methyl, about 6 to about 15 ethyl branches, about 2 to about 10 propyl branches, about 2 to about 10 butyl branches, about 2 to about 8 amyl branches, and about 2 to about 15 hexyl or longer branches.

6. The polyolefin as recited in claim 4 which is an ethylene homopolymer.

7. A polymer, consisting essentially of units derived from the monomers ethylene and a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen,

hydrocarbyl or substituted hydrocarbyl, and m is 0 or an integer from 1 to 16, and which contains about 0.01 to about 40 mole percent of repeat units derived from said compound, and provided that said repeat units derived from said compound are in branches of the formula $-CH(CH_3)_nCO_2R^1$, in about 30 to about 70 mole percent of said branches n is 5 or more, in about 0 to about 20 mole percent n is 4, in about 3 to 60 mole percent n is 1, 2 and 3, and in about 1 to about 60 mole percent n is 0.

8. The polymer as recited in claim 7 wherein m is 0.

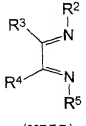
9. The polymer as recited in claim 7 wherein R^1 is hydrocarbyl or substituted hydrocarbyl.

10. The polymer as recited in claim 7 wherein R^1 is alkyl containing 1 to 10 carbon atoms.

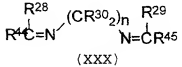
11. The polymer as recited in claim 8 wherein R^1 is hydrocarbyl or substituted hydrocarbyl.

12. The polymer as recited in claim 7 wherein about 0.1 to about 20 mole percent of said units are derived from said compound.

13. A process for the polymerization of olefins, comprising, contacting a transition metal complex of a bidentate ligand selected from the group consisting of



(VIII)



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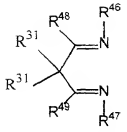

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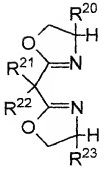


(XXXII)

with an olefin wherein:

said olefin is selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, norbornene, or a substituted norbornene,;

said transition metal is selected from the group consisting of Ti, Zr, Sc, V, Cr, a rare earth metal, Fe, Co, Ni or Pd;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

R^{44} is hydrocarbyl or substituted hydrocarbyl, and R^{28} is hydrogen, hydrocarbyl or substituted hydrocarbyl or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl or substituted hydrocarbyl, and R^{29} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen, substituted hydrocarbyl or hydrocarbyl, or two of R^{30} taken together form a ring;

R^{20} and R^{23} are independently hydrocarbyl or substituted hydrocarbyl;

R^{21} and R^{22} are each in independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

R^{1} is hydrogen, hydrocarbyl or substituted hydrocarbyl;

n is 2 or 3;

and provided that:

when said bidentate ligand is (XXX) M is not Pd;

when M is Pd a diene is not present; and

said transition metal also has bonded to it a ligand that may be displaced by said olefin or add to said olefin;

when norbornene or substituted norbornene is used no other olefin is present.

14. The process as recited in claim 13 wherein said transition metal is Co, Fe, Ni or Pd.

15. The process as recited in claim 13 wherein said transition metal is Ni or Pd.

16. The process as recited in claim 13 or 15 wherein said olefin is ethylene, $R^{17}CH=CH_2$, or cyclopentene , wherein R^{17} is n-alkyl.

17. The process as recited in claim 13 wherein said olefin comprises cyclopentene.

18. The process as recited in claim 13, 14, 15, or 16 wherein said bidentate ligand is (VIII).

19. The process as recited in claim 18 wherein said olefin is ethylene.

20. The process as recited is in claim 18 wherein said olefin is propylene.

21. The process as recited in claim 18 wherein said olefin is a combination of ethylene and propylene.

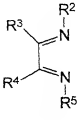
22. The process as recited in claim 18 wherein said olefin is contained in a mixed butenes stream.

23. The process as recited in claim 18 wherein R^2 and R^5 are each independently hydrocarbyl provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

24. The process as recited in claim 18 wherein R^3 and R^4 are each independently hydrogen or methyl or together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

25. The process as recited in claim 18 wherein said olefin comprises cyclopentene.

26. A process for the copolymerization of an olefin and a fluorinated olefin, comprising, contacting a transition metal complex of a bidentate ligand selected from the group consisting of



(VIII)

with an olefin, and a fluorinated olefin wherein:

said olefin is selected from the group consisting of ethylene and an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$;

said transition metal is selected from the group consisting of Ni and Pd;

said fluorinated olefin is of the formula $H_2C=CH(CH_2)_aR_fR^{42}$;

a is an integer of 2 to 20; R_f is perfluoroalkylene optionally containing one or more ether groups;

R^{42} is fluorine or a functional group;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently saturated hydrocarbyl;

and provided that said transition metal also has bonded to it a ligand that may be displaced by said olefin or added to said olefin.

27. The process as recited in claim 26 wherein R^{42} is fluorine, ester or sulfonyl halide.

28. The process as recited in claim 26 wherein R_f is $-(CF_2)_b-$, wherein b is 2 to 20, or $-(CF_2)_dOCF_2CF_2-$ wherein d is 2 to 20.

29. The process as recited in claim 26 or 27 wherein said olefin is ethylene or wherein said olefin is $R^{17}CH=CH_2$, wherein R^{17} is n-alkyl.

30. The process as recited in claim 26 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

31. A copolymer of an olefin of the formula $R^{17}CH=CHR^{17}$ and a fluorinated olefin of the formula $H_2C=CH(CH_2)_aR_fR^{42}$, wherein:

each R^{17} is independently hydrogen or saturated hydrocarbyl;

a is an integer of 2 to 20; R_f is perfluoroalkylene optionally containing one or more ether groups; and

R^{42} is fluorine or a functional group;

provided that when both of R^{17} are hydrogen and R^{42} is fluorine, R_f is $-(CF_2)_b-$ wherein b is 2 to 20 or perfluoroalkylene containing at least one ether group.

32. The copolymer as recited in claim 31 wherein R^{42} is fluorine, ester, sulfonic acid, or sulfonyl halide.

33. The copolymer as recited in claim 31 wherein R_f is $-(CF_2)_b-$, wherein b is 2 to 20, or $-(CF_2)_dOCF_2CF_2-$ wherein d is 2 to 20.

34. The copolymer as recited in claim 31 or 32 wherein said olefin is ethylene or wherein said olefin is $R^{17}CH=CH_2$, wherein R^{17} is n-alkyl.

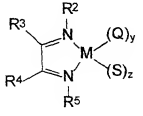
35. The copolymer as recited in claim 31 wherein said fluorinated olefin is about 1 to 20 mole percent of repeat units in said copolymer.

36. An acid catalyst of the composition of claim 31, wherein R^{42} is sulfonic acid.

37. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

a first compound W, which is a neutral Lewis acid capable of abstracting either Q^- or S^- to form WQ^- or WS^-, provided that the anion formed is a weakly coordinating anion; or a cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion;

a second compound of the formula



(XI)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, or norbornene;

wherein:

M is Ti, Zr, Sc, V, Cr, a rare earth metal, Fe, Co, Ni or Pd in the m oxidation state;

y + z = m

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide, or bromide; and

provided that;

when norbornene or substituted norbornene is present, no other monomer is present;

when M is Pd a diene is not present; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

38. The process as recited in claim 37 wherein said monomer is ethylene only.

39. The process as recited in claim 37 wherein said monomer is an α-olefin only.

40. The process as recited in claim 39 wherein said α-olefin is propylene.

41. The process as recited in claim 37 done in the presence of a solvent.

42. The process as recited in claim 41 wherein R^3 and R^4 are each independently hydrogen or methyl, or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

43. The process as recited in claim 37 used to make a block polymer.

44. The process as recited in claim 37 wherein:

M is Ti(IV), Q and S are chloride, and y and z are 2;

M is Zr(IV), Q and S are chloride, and y and z are 2;

M is Co(II), Q and S are bromide, and y and z are 1;

M is Fe(II), Q and S are chloride, and y and z are 1;

M is Sc(III), Q and S are chloride, y is 1 and z is 2;

M is Ni(II), Q and S are bromide or chloride, and y and z are 1;

M is Pd(II), Q and S are methyl, and y and z are 1;

M is Pd(II), Q and S are chloride, and y and z are 1;

M is Ni(I), Q is methyl, chloride, bromide, iodide or acetylacetonate, y is 1, and z is 0;

M is Pd(II), Q is methyl and S is chloride, and y and z are 1; or

M is Ni(II), Q and S are methyl, and y and z are 1.

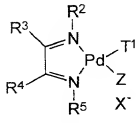
45. The process as recited in claim 37 wherein ethylene and propylene are the monomers.

46. The process as recited in claim 37 wherein said monomers are part of a crude butenes stream.

47. The process as recited in claim 37 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

48. The process as recited in claim 37 wherein said monomer comprises cyclopentene.

49. A process for the production of polyolefins, comprising, contacting, at a temperature of about -100°C to about +200°C, one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene; and a compound of the formula



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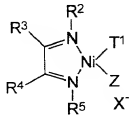

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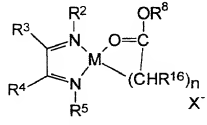
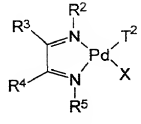


(IV)

or



(VII)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound is less than about 6;

X is a weakly coordinating anion;

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

M is Ni(II) or Pd(II);

each R^{16} is independently hydrogen or alkyl containing 1 to 10 carbon atoms;

n is 1, 2, or 3;

R^8 is hydrocarbyl; and

T^2 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, hydrocarbyl substituted with keto or ester groups but not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

provided that:

when M is Pd, or (II) or (VII) are present, a diene is not present; and

when norbornene or substituted norbornene is used no other monomer is present.

50. The process as recited in claim 49 wherein said monomer is ethylene only.

51. The process as recited in claim 49 wherein said monomer is an α-olefin only.

52. The process as recited in claim 51 wherein said α-olefin is propylene.

53. The process as recited in claim 49 wherein said compound is (II), (IV) or (VII), M is Pd(II), and a comonomer selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone, is also present.

54. The process as recited in claim 53 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

55. The process as recited in claim 49 done in the presence of a solvent.

56. The process as recited in claim 49 done in the absence of a solvent.

57. The process as recited in claim 49 wherein R^3 and R^4 are each independently hydrogen or methyl, or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

58. The process as recited in claim 49 used to make a block polymer.

59. The process as recited in claim 49 wherein X is BAF, SbF_6, PF_6, or BF_4.

60. The process as recited in claim 57 wherein X is BAF, SbF_6, PF_6, or BF_4.

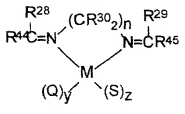
61. The process as recited in claim 60 wherein a monomer is ethylene or propylene.

62. The process as recited in claim 49 wherein the monomers are ethylene and propylene.

63. The process as recited in claim 49 wherein said monomers are part of a crude butenes stream.

64. The process as recited in claim 49 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

65. A process for the production of polyolefins, comprising contacting, at a temperature of about -100°C to about +200°C, one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene; with a compound of the formula



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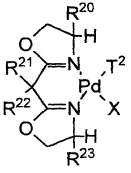
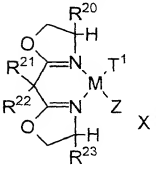


(XVIII)

or



(XIII)

wherein:

R^{44} is hydrocarbyl or substituted hydrocarbyl, and R^{28} is hydrogen, hydrocarbyl or substituted hydrocarbyl or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl or substituted hydrocarbyl, and R^{29} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen, substituted hydrocarbyl or hydrocarbyl or two of R^{30} taken together form a ring; R^{20} and R^{23} are independently hydrocarbyl or substituted hydrocarbyl;

R^{21} and R^{22} are each in independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

n is 2 or 3;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

M is Ti, Zr, Sc, Cr, a rare earth metal, V, Fe, Co, Ni or Pd the m oxidation state;

for (XVII), y + z = m;

for (XIII), m is 2;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide, or bromide;

T^2 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, hydrocarbyl substituted with keto or ester groups but not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound is less than about 6; and

X is a weakly coordinating anion; and

provided that:

when said compound is (XVII) M is not Pd; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

66. The process as recited in claim 65 wherein said monomer is ethylene only.

67. The process as recited in claim 65 wherein said monomer is an α-olefin only.

68. The process as recited in claim 67 wherein said α-olefin is propylene.

69. The process as recited in claim 66 wherein M is Pd(II) and one or more comonomer is selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl

or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

70. The process as recited in claim 69 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

71. The process as recited in claim 65 done in the presence of a solvent.

72. The process as recited in claim 65 done in the absence of a solvent.

73. The process as recited in claim 65 used to make a block polymer.

74. The process as recited in claim 65 wherein X is BAF, SbF_6, PF_6, or BF_4.

75. The process as recited in claim 74 wherein a monomer is ethylene or propylene.

76. The process as recited in claim 75 wherein the monomers are ethylene and propylene.

77. The process as recited in claim 65 wherein said monomers are part of a crude butenes stream.

78. The process as recited in claim 65 wherein:

R^{44} is hydrocarbyl, and R^{28} is hydrogen or hydrocarbyl, or R^{44} and R^{28} taken together form a ring;

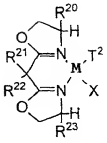
R^{45} is hydrocarbyl, and R^{29} is hydrogen or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen or hydrocarbyl, or two of R^{30} taken together form a ring;

R^{21} and R^{22} are each in independently hydrogen or hydrocarbyl; and

R^{20} and R^{23} are independently hydrocarbyl.

79. A process for the production of polyolefins, comprising contacting, at a temperature of about -100°C to about +200°C, one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene; with a compound of the formula



(XVIII)

wherein:

R^{20} and R^{23} are independently hydrocarbyl or substituted hydrocarbyl;

R^{21} and R^{22} are each in independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

X is a weakly coordinating anion;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

M is Ni(II) or Pd(II);

T^2 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, hydrocarbyl substituted with keto or ester groups but not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

and provided that:

when M is Pd a diene is not present; and

when norbornene or substituted norbornene is used no other monomer is present.

80. **The process as recited in claim 79 wherein** said monomer is ethylene only.

81. The process as recited in claim 79 wherein said monomer is an α-olefin only.

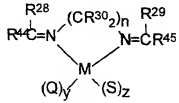
82. The process as recited in claim 81 wherein said α-olefin is propylene.

83. **The process as recited in claim 79 wherein** T^2 is methyl; R^{20} and R^{23} are independently hydrocarbyl; and R^{21} and R^{22} are each in independently hydrogen or hydrocarbyl.

84. A process for the production for polyolefins, comprising contacting, at a temperature of about -100°C to about +200°C,

a first compound W, which is a neutral Lewis acid capable of abstracting either Q^- or S^- to form WQ^- or WS^-, provided that the anion formed is a weakly coordinating anion; or a cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion;

a second compound of the formula



(XVII)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, or norbornene;

wherein:

M is Ti, Zr, V, Cr, a rare earth metal, Co, Fe, Sc, or Ni, of oxidation state m;

R^{44} is hydrocarbyl or substituted hydrocarbyl, and R^{28} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl or substituted hydrocarbyl, and R^{29} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen, substituted hydrocarbyl or hydrocarbyl, or two of R^{30} taken together form a ring;

n is 2 or 3;

y and z are positive integers;

y+z = m;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond

in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide, or bromide; and

provided that;

when norbornene or substituted norbornene is present, no other monomer is present.

85. The process as recited in claim 84 wherein R^{28}, R^{29}, and each of R^{30} are hydrogen.

86. The process as recited in claim 84 wherein said monomer is ethylene only.

87. The process as recited in claim 84 wherein said monomer is an α-olefin only.

88. The process as recited in claim 87 wherein said α-olefin is propylene.

89. The process as recited in claim 84 done in the presence of a solvent.

90. The process as recited in claim 84 wherein both R^{44} and R^{45} are 2,4,6-trimethylphenyl.

91. The process as recited in claim 84 used to make a block polymer.

92. The process as recited in claim 90 wherein a monomer is ethylene or propylene.

93. The process as recited in claim 84 wherein:

M is Ti(IV), Q and S are chloride, and y and z are 2;

M is Zr(IV), Q and S are chloride, and y and z are 2;

M is Co(II), Q and S are bromide, and y and z are 1;

M is Fe(II), Q and S are chloride, and y and z are 1;

M is Sc(III), Q and S are chloride, y is 1 and z is 2;

M is Ni(II), Q and S are bromide or chloride, and y and z are 1;

M is Pd(II), Q and S are chloride, and y and z are 1;

M is Pd(II), Q and S are methyl, and y and z are 1;

M is Ni(I), Q is methyl, chloride, bromide, iodide or acetylacetonate, y is 1, and z is 0;

M is Pd(II), Q is methyl and S is chloride, and y and z are 1; or

M is Ni(II), Q and S are methyl, and y and z are 1.

94. The process as recited in claim 84 wherein ethylene and propylene are the monomers.

95. The process as recited in claim 84 wherein said monomers are part of a crude butenes stream.

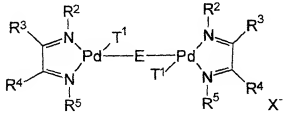
96. The process as recited in claim 84 wherein:

R^{44} is hydrocarbyl, and R^{28} is hydrogen or hydrocarbyl, or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl, and R^{29} is hydrogen or hydrocarbyl, or R^{45} and R^{29} taken together form a ring; and

each R^{30} is independently hydrogen or hydrocarbyl, or two of R^{30} taken together form a ring.

97. A process for the production of polyolefins, comprising, contacting, at a temperature of about -100°C to about +200°C, one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene; optionally a source of X^-, and a compound of the formula



(V)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided thatR^{17} contains no olefinic bonds;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds;

E is halogen or $-OR^{18}$;

R^{18} is hydrocarbyl not containing olefinic or acetylenic bonds; and

X is a weakly coordinating anion;

provided that when norbornene or substituted norbornene is present no other monomer is present.

98. The process as recited in claim 97 wherein said monomer is ethylene only.

99. The process as recited in claim 97 wherein said monomer is an α-olefin only.

100. The process as recited in claim 99 wherein said α-olefin is propylene.

101. The process as recited in claim 97 wherein E is chlorine.

102. The process as recited in claim 97 wherein T^1 is alkyl.

103. The process as recited in claim 97 done in the presence of a solvent.

104. The process as recited in claim 98 wherein E is chlorine and T^1 is alkyl.

105. The process as recited in claim 104 wherein R^2 and R^4 are each independently hydrogen or methyl or R^3 and R^4 taken together are 1,8-naphthylylene, both R^2 and R^5 are 2,6-diisopropylphenyl, and T^1 is methyl.

106. The process as recited in claim 97 used to make a block polymer.

107. The process as recited in claim 105 wherein X is BAF, SbF_6, PF_6, or BF_4.

108. The process as recited in claim 107 wherein a monomer is ethylene or propylene.

109. The process as recited in claim 97 wherein the monomers are ethylene and propylene.

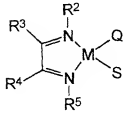
110. The process as recited in claim 97 wherein said monomers are part of a crude butenes stream.

111. The process as recited in claim 97 wherein R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring.

112. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

a first compound W, which is a neutral Lewis acid capable of abstracting either Q^- or S^- to form WQ^- or WS^-, provided that the anion formed is a weakly coordinating anion; or a cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion;

a second compound of the formula



(I)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, 4-vinylcyclohexene, cyclobutene, cyclopentene, substituted norbornene, and norbornene;

wherein:

M is Ni(II), Co(II), Fe(II) or Pd(II);

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide, or bromide; and

provided that:

when norbornene or substituted norbornene is present, no other monomer is present, and further provided that when 4-vinylcyclohexene is present M is Ni;

when M is Pd a diene is not present; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

113. The process as recited in claim 112 wherein said monomer is ethylene only.

114. The process as recited in claim 112 wherein said monomer is an α-olefin only.

115. The process as recited in claim 114 wherein said α-olefin is propylene.

116. The process as recited in claim 112 done in the presence of a solvent.

117. The process as recited in claim 112 wherein R^3 and R^4 are each independently hydrogen or methyl or both of R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

118. The process as recited in claim 112 used to make a block polymer.

119. The process as recited in claim 112 wherein a monomer is ethylene or propylene.

120. The process as recited in claim 112 wherein the molar ratio of said first compound: said second compound (I) is about 5 to about 1000.

121. The process as recited in claim 112 wherein the molar ratio of said first compound: said second compound (I) is about 10 to about 100.

122. The process as recited in claim 112 wherein said first compound is R^9AlCl_2, $R^9{}_2AlCl$, $R^9{}_3Al_2Cl_3$, or an alkylaluminoxane in which the alkyl group has 1 to 4 carbon atoms, and wherein R^9 is alkyl containing 1 to 4 carbon atoms.

123. The process as recited in claim 120 wherein said first compound is R^9AlCl_2, $R^9{}_2AlCl$, $R^9{}_3Al_2Cl_3$, or an alkylaluminoxane in which the alkyl group has 1 to 4 carbon atoms, and wherein R^9 is alkyl containing 1 to 4 carbon atoms.

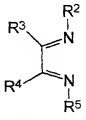
124. The process as recited in claim 112 wherein the monomer comprises cyclopentene.

125. The process as recited in claim 112 wherein said monomers are part of a crude butenes stream.

126. The process as recited in claim 112 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3

and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

127. A polymerization process, comprising, contacting a compound of the formula $[Pd(R^{13}CN)_4]X_2$, or a combination of $Pd[OC(O)R^{40}]_2$ and HX, with a compound of the formula



(VIII)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene, wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl providedR^{17} contains no olefinic bonds;

R^{13} is hydrocarbyl;

R^{40} is hydrocarbyl or substituted hydrocarbyl; and

X is a weakly coordinating anion;

provided that when norbornene or substituted norbornene, is present no other monomer is present.

128. The process as recited in claim 127 wherein said monomer is ethylene only.

129. The process as recited in claim 127 wherein said monomer is an α-olefin only.

130. The process as recited in claim 129 wherein said α-olefin is propylene.

131. The process as recited in claim 127 wherein one or more comonomer selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

132. The process as recited in claim 131 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

133. The process as recited in claim 127 done in the presence of a solvent.

134. The process as recited in claim 127 wherein R^3 and R^4 are each independently hydrogen or methyl or both R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

135. The process as recited in claim 127 used to make a block polymer.

136. The process as recited in claim 127 wherein X is BAF, SbF_6, PF_6, or BF_4.

137. The process as recited in claim 134 wherein X is BAF or BF_4.

138. The process as recited in claim 137 wherein a monomer is ethylene or propylene.

139. The process as recited in claim 127 wherein the monomers are ethylene and propylene.

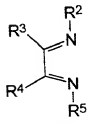
140. The process as recited in claim 127 wherein said monomers are part of a crude butenes stream.

141. The process as recited in claim 127 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

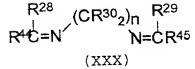
142. A polymerization process, comprising, contacting:

a Ni[0], Pd[0] or Ni[I] compound containing a ligand which may be displaced by a ligand of the formula (VIII), (XXX), (XXXII) or (XXIII);

a second compound of the formula



(VIII)



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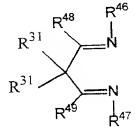
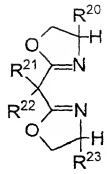


(XXIII)

or



(XXXII)

an oxidizing agent;

a source of a relatively weakly coordinati anion;

and one or more monomers selected from the group consisting of ethylene, an olefin of the for $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene;

wherein:

R^2 and R^5 are each independently hydrocarb substituted hydrocarbyl, provided that the carbon bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefini in said olefin is separated from any other olefi bond or aromatic ring by a quaternary carbon ato least two saturated carbon atoms;

each R^{31} is independently hydrogen, hydrc or substituted hydrocarbyl;

R^{44} is hydrocarbyl or substituted hydroca and R^{28} is hydrogen, hydrocarbyl or substituted hydrocarbyl or R^{44} and R^{28} taken together form a

R^{45} is hydrocarbyl or substituted hydroca and R^{29} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{45} and R^{29} taken together form a

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drocarbyl, or two of R^{30} taken
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drocarbyl, provided that the carbon
imino nitrogen atom has at least two
i to it;
3;
' are each independently hydrogen,
ibstituted hydrocarbyl;
' are independently hydrocarbyl or
carbyl;
are each in independently hydrogen,
ostituted hydrocarbyl; and
;
ene or substituted norbornene is
monomer is present;
compound is used, a diene is not

ond compound is (XXX) only an Ni[0]
is used.
ess as recited in claim 142 wherein
hylene only.
ess as recited in claim 142 wherein
α-olefin only.
ess as recited in claim 144 wherein
ropylene.
ess as recited in claim 142 done in
solvent.
ess as recited in claim 142 used to
er.
ess as recited in claim 142 wherein
thylene and propylene.
ess as recited in claim 142 wherein
part of a crude butenes stream.
ess as recited in claim 142 wherein:
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carbon atom bound to the imino

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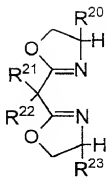


(XXXII)

an oxidizing agent;

a source of a relatively weakly coordinating anion;

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene;

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

each R^{31} is independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

R^{44} is hydrocarbyl or substituted hydrocarbyl, and R^{28} is hydrogen, hydrocarbyl or substituted hydrocarbyl or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl or substituted hydrocarbyl, and R^{29} is hydrogen, substituted hydrocarbyl or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen, substituted hydrocarbyl or hydrocarbyl, or two of R^{30} taken together form a ring;

R^{46} and R^{47} are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

n is 2 or 3;

R^{48} and R^{49} are each independently hydrogen, hydrocarbyl, or substituted hydrocarbyl;

R^{20} and R^{23} are independently hydrocarbyl or substituted hydrocarbyl;

R^{21} and R^{22} are each in independently hydrogen, hydrocarbyl or substituted hydrocarbyl; and

provided that;

when norbornene or substituted norbornene is present, no other monomer is present;

when a Pd[0] compound is used, a diene is not present; and

when said second compound is (XXX) only an Ni[0] or Ni[I] compound is used.

143. The process as recited in claim 142 wherein said monomer is ethylene only.

144. The process as recited in claim 142 wherein said monomer is an α-olefin only.

145. The process as recited in claim 144 wherein said α-olefin is propylene.

146. The process as recited in claim 142 done in the presence of a solvent.

147. The process as recited in claim 142 used to make a block polymer.

148. The process as recited in claim 142 wherein the monomers are ethylene and propylene.

149. The process as recited in claim 142 wherein said monomers are part of a crude butenes stream.

150. The process as recited in claim 142 wherein:

R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino

nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

each R^{31} is independently hydrogen or hydrocarbyl;

R^{44} is hydrocarbyl, and R^{28} is hydrogen or hydrocarbyl or R^{44} and R^{28} taken together form a ring;

R^{45} is hydrocarbyl, and R^{29} is hydrogen, or hydrocarbyl, or R^{45} and R^{29} taken together form a ring;

each R^{30} is independently hydrogen or hydrocarbyl, or two of R^{30} taken together form a ring;

R^{46} and R^{47} are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

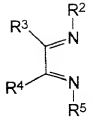
R^{48} and R^{49} are each independently hydrogen or hydrocarbyl;

R^{20} and R^{23} are independently hydrocarbyl; and

R^{21} and R^{22} are each in independently hydrogen or hydrocarbyl.

151. The process as recited in claim 142 wherein said olefin comprises cyclopentene.

152. A polymerization process, comprising, contacting an Ni[0] complex containing a ligand or ligands which may be displaced by (VIII), oxygen, an alkyl aluminum compound, and a compound of the formula



(VIII)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene; wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring; and

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

provided that, when norbornene or substituted norbornene is present, no other monomer is present.

153. The process as recited in claim 152 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

154. The process as recited in claim 152 wherein said Ni[0] complex is a 1,5-cyclooctadiene complex.

155. The process as recited in claim 152 wherein said monomer is ethylene only.

156. The process as recited in claim 152 wherein said olefin comprises cyclopentene.

157. The process as recited in claim 152 wherein said monomer is an α-olefin only.

158. The process as recited in claim 157 wherein said α-olefin is propylene.

159. The process as recited in claim 152 done in the presence of a solvent.

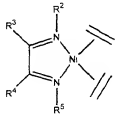
160. The process as recited in claim 156 used to make a block polymer.

161. The process as recited in claim 152 wherein the monomers are ethylene and propylene.

162. The process as recited in claim 152 wherein said monomers are part of a crude butenes stream.

163. A polymerization process, comprising, contacting oxygen and an alkyl aluminum compound, or a compound of the formula HX, and a compound of the formula

(XXXIII)



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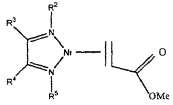

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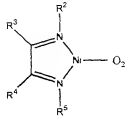

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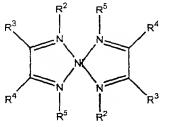


or (XXXXV)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene; wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom

bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring; and

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

X is a weakly coordinating anion; and

provided that, when norbornene or substituted norbornene is present, no other monomer is present.

164. The process as recited in claim 163 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

165. The process as recited in claim 142 wherein said Ni[0] compound is bis(1,5cycloocatdiene)nickel or bis(o-tolylphosphito)nickel(ethylene) or said Pd[0] compound is tris(dibenzylideneacetone)dipalladium[0].

166. The process as recited in claim 163 wherein said monomer is ethylene only.

167. The process as recited in claim 163 wherein said olefin comprises cyclopentene.

168. The process as recited in claim 163 wherein said monomer is an α-olefin only.

169. The process as recited in claim 168 wherein said α-olefin is propylene.

170. The process as recited in claim 163 done in the presence of a solvent.

171. The process as recited in claim 163 used to make a block polymer.

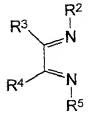
172. The process as recited in claim 163 wherein the monomers are ethylene and propylene.

173. The process as recited in claim 163 wherein said monomers are part of a crude butenes stream.

174. The process as recited in claim 164 wherein said olefin comprises cyclopentene.

175. The process as recited in claim 164 wherein said monomer is ethylene only.

176. A polymerization process, comprising, contacting an Ni[0] complex containing a ligand or ligands which may be displaced by (VIII), HX or a Bronsted acidic solid, and a compound of the formula



(VIII)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene; wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms; and

X is a weakly coordinating anion;

provided that, when norbornene or substituted norbornene is present, no other monomer is present.

177. The process as recited in claim 176 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

178. The process as recited in claim 176 wherein said Ni[0] complex is bis(1,5-cycloocatidene)nickel or bis(o-tolylphosphito)nickel(ethylene)

179. The process as recited in claim 176 wherein said monomer is ethylene only.

180. The process as recited in claim 176 wherein said olefin comprises cyclopentene.

181. The process as recited in claim 176 wherein said monomer is an α-olefin only.

182. The process as recited in claim 181 wherein said α-olefin is propylene.

183. The process as recited in claim 176 done in the presence of a solvent.

184. The process as recited in claim 176 used to make a block polymer.

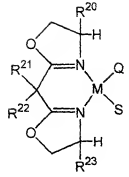
185. The process as recited in claim 176 wherein the monomers are ethylene and propylene.

186. The process as recited in claim 176 wherein said monomers are part of a crude butenes stream.

187. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

a first compound W, which is a neutral Lewis acid capable of abstracting either Q^- or S^- to form WQ^- or WS^-, provided that the anion formed is a weakly coordinating anion; or a cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion;

a second compound of the formula



XIX

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, or norbornene;

wherein:

M is Ni(II) or Pd(II);

R^{20} and R^{23} are independently hydrocarbyl or substituted hydrocarbyl;

R^{21} and R^{22} are each in independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide, or bromide;

provided that;

when norbornene or substituted norbornene is present, no other monomer is present;

when M is Pd a diene is not present; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

188. The process as recited in claim 187 wherein said monomer is ethylene only.

189. The process as recited in claim 187 wherein said monomer is an α-olefin only.

190. The process as recited in claim 189 wherein said α-olefin is propylene.

191. The process as recited in claim 187 done in the presence of a solvent.

192. The process as recited in claim 187 used to make a block polymer.

193. The process as recited in claim 191 wherein a monomer is ethylene or propylene.

194. The process as recited in claim 187 wherein the molar ratio of said first compound: said second compound (I) is about 5 to about 1000

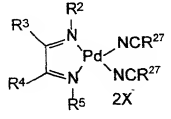
195. The process as recited in claim 187 wherein the molar ratio of said first compound: said second compound (I) is about 10 to about 100.

196. The process as recited in claim 187 wherein the monomers are ethylene and propylene.

197. The process as recited in claim 187 wherein said monomers are part of a crude butenes stream.

198. The process as recited in claim 187 wherein R^{20} and R^{23} are independently hydrocarbyl; R^{21} and R^{22} are each in independently hydrogen or hydrocarbyl; and each R^{17} is independently hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms.

199. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C, a compound of the formula



(XIV)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene; wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that R^{17} does not contain any olefinic bonds; and

each R^{27} is independently hydrocarbyl;

each X is a weakly coordinating anion;

provided that, when norbornene or substituted norbornene is present, no other monomer is present.

200. The process as recited in claim 199 wherein both R^{27} are methyl.

201. The process as recited in claim 199 wherein said monomer is ethylene only.

202. The process as recited in claim 199 wherein said monomer is an α-olefin only.

203. The process as recited in claim 202 wherein said α-olefin is propylene.

204. The process as recited in claim 199 wherein one or more comonomer selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

205. The process as recited in claim 204 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

206. The process as recited in claim 199 done in the presence of a solvent.

207. The process as recited in claim 199 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

208. The process as recited in claim 199 used to make a block polymer.

209. The process as recited in claim 199 wherein X is BAF, SbF_6, PF_6, or BF_4.

210. The process as recited in claim 207 wherein X is BAF or BF_4.

211. The process as recited in claim 210 wherein a monomer is ethylene or propylene.

212. The process as recited in claim 199 wherein the monomers are ethylene and propylene.

213. The process as recited in claim 199 wherein said monomers are part of a crude butenes stream.

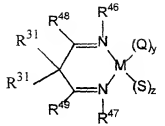
214. The process as recited in claim 199 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring, and each R^{17} is hydrocarbyl.

215. The process as recited in claim 199 wherein said olefin comprises cyclopentene.

216. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

a first compound W, which is a neutral Lewis acid capable of abstracting either Q^- or S^- to form WQ^- or WS^-, provided that the anion formed is a weakly coordinating anion; or a cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion;

a second compound of the formula



(XV)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene; wherein:

R^{46} and R^{47} are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^{48} and R^{49} are each independently hydrogen, hydrocarbyl, or substituted hydrocarbyl;

each R^{31} is independently hydrocarbyl, substituted hydrocarbyl, or hydrogen;

M is Ti, Zr, V, Cr, a rare earth metal, Co, Fe, Sc, Ni, or Pd of oxidation state m;

y and z are positive integers;

y+z = m;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

Q is alkyl, hydride, chloride, iodide, or bromide;

S is alkyl, hydride, chloride, iodide or bromide; and

provided that;

when norbornene or substituted norbornene is present, no other monomer is present;

when M is Pd a diene is not present; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

217. The process as recited in claim 216 wherein each R^{31} is hydrogen.

218. The process as recited in claim 216 wherein said monomer is ethylene only.

219. The process as recited in claim 216 wherein said monomer is an α-olefin only.

220. The process as recited in claim 219 wherein said α-olefin is propylene.

221. The process as recited in claim 216 done in the presence of a solvent.

222. The process as recited in claim 216 wherein R^{48} and R^{49} are each independently hydrogen or methyl, both R^{46} and R^{47} are 2,6-diisopropylphenyl, and T^1 is methyl.

223. The process as recited in claim 216 used to make a block polymer.

224. The process as recited in claim 216 wherein M is Ni(II).

225. The process as recited in claim 216 wherein M is Pd(II).

226. The process as recited in claim 225 wherein a monomer is ethylene or propylene.

227. The process as recited in claim 216 wherein:

M is Ti(IV), Q and S are chloride, and y and z are 2;

M is Zr(IV), Q and S are chloride, and y and z are 2;

M is Co(II), Q and S are bromide, and y and z are 1;

M is Fe(II), Q and S are chloride, and y and z are 1;

M is Sc(III), Q and S are chloride, y is 1 and z is 2;

M is Ni(II), Q and S are bromide or chloride, and y and z are 1; M is Pd(II), Q and S are methyl, and y and z are 1;

M is Ni(I), Q is methyl, chloride, bromide, iodide or acetylacetonate, y is 1, and z is 0;

or

M is Ni(II), Q and S are methyl, and y and z are 1.

228. The process as recited in claim 216 wherein the monomers are ethylene and propylene.

229. The process as recited in claim 216 wherein said monomers are part of a crude butenes stream.

230. The process as recited in claim 216 wherein:

R^{46} and R^{47} are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

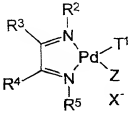
R^{48} and R^{49} are each independently hydrogen, hydrocarbyl, or substituted hydrocarbyl;

each R^{31} is independently hydrocarbyl, substituted hydrocarbyl, or hydrogen; and

each R^{17} is hydrocarbyl.

231. The process as recited in claim 216 wherein said olefin comprises cyclopentene.

232. A compound of the formula



(II)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound is less than about 6;

X is a weakly coordinating anion; and

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds;

provided that when R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring Z is not an organic nitrile.

233. The compound as recited in claim 232 wherein T^1 is methyl, and Z is $R^6{}_2O$ or R^7CN wherein each R^6 independently hydrogen or hydrocarbyl and R^7 is hydrocarbyl.

234. The compound as recited in claim 232 wherein R^3 and R^4 are each independently hydrogen or methyl or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

235. The compound as recited in claim 233 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl, and wherein X is BAF, SbF_6, PF_6, or BF_4.

236. The compound as recited in claim 232 wherein X is BAF^-, SbF_6^-, PF_6^-, or BF_4^-.

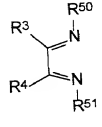
237. The compound as recited in claim 232 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a carbocyclic ring.

238. The compound as recited in claim 232 wherein each of R^2, R^3, R^4, R^5, T^1, Z, and X are as follows:

R^2	R^3	R^4	R^5	T^1	Z	X
2,6-i-PrPh	Me	Me	2,6-i-PrPh	Me	OEt_2	BAF
2,6-i-PrPh	H	H	2,6-i-PrPh	Me	OEt_2	BAF
2,6-MePh	H	H	2,6-MePh	Me	OEt_2	BAF
2,6-MePh	Me	Me	2,6-MePh	Me	OEt_2	BAF
2,6-i-PrPh	Me	Me	2,6-i-PrPh	Me	OEt_2	SbF_6
2,6-i-PrPh	Me	Me	2,6-i-PrPh	Me	OEt_2	BF_4
2,6-i-PrPh	Me	Me	2,6-i-PrPh	Me	OEt_2	PF_6
2,6-i-PrPh	H	H	2,6-i-PrPh	Me	OEt_2	SbF_6
2,4,6-MePh	Me	Me	2,4,6-MePh	Me	OEt_2	SbF_6
2,6-i-PrPh	An	An	2,6-i-PrPh	Me	OEt_2	SbF_6
2,6-i-PrPh	Me	Me	2,6-i-PrPh	Me	NCMe	SbF_6
Ph	Me	Me	Ph	Me	NCMe	SbF_6
2,6-EtPh	Me	Me	2,6-EtPh	Me	NCMe	BAF
2,6-EtPh	Me	Me	2,6-EtPh	Me	NCMe	SbF_6
2-t-BuPh	Me	Me	2-t-BuPh	Me	NCMe	SbF_6
1-Np	Me	Me	1-Np	Me	NCMe	SbF_6
Ph_2CH	H	H	Ph_2CH	Me	NCMe	SbF_6
2-PhPh	Me	Me	2-PhPh	Me	NCMe	SbF_6
Ph	a	a	Ph	Me	NCMe	BAF
Ph	Me	Me	Ph	Me	NCMe	SbF_6
Ph	Ph	Ph	Ph	Me	NCMe	BAF
Ph_2CH	H	H	Ph_2CH	Me	NCMe	SbF_6
Ph_2CH	H	H	Ph_2CH	Me	SMe_2	SbF_6

[a] $-CMe_2CH_2CMe_2-$.

239. A compound of the formula



wherein:

R^{50} is substituted phenyl;

R^{51} is phenyl or substituted phenyl;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

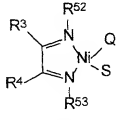
and provided that groups in the 2 and 6 positions of R^{50} have a difference in E_s of about 0.15 or more.

240. The compound as recited in claim 239 wherein groups in the 2 and 6 of R^{51} have a difference in E_s of about 0.60 or more.

241. The compound as recited in claim 239 wherein the group in the 2 position of R^{50} is t-butyl and the group in 6 position of R^{50} is methyl or hydrogen.

242. The compound as recited in claim 241 wherein the group in the 2 position of R^{51} is t-butyl and the group in 6 position of R^{51} is methyl or hydrogen.

243. A compound of the formula



(XXXVI)

wherein:

R^{52} is substituted phenyl;

R^{53} is phenyl or substituted phenyl;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

Q is alkyl, hydride, chloride, bromide or iodide;

S is alkyl, hydride, chloride, bromide or iodide;

and provided that;

groups in the 2 and 6 positions of R^{52} have a difference in E_s of 0.15 or more; and

except when M is Pd, when both Q and S are each independently chloride, bromide or iodide W is capable of transferring a hydride or alkyl group to M.

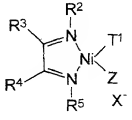
244. The compound as recited in claim 243 wherein said difference is about 0.20 more.

245. The compound as recited in claim 243 wherein groups in the 2 and 6 of R^{51} have a difference in E_s of 0.15 or more.

246. The compound as recited in claim 243 wherein the group in the 2 position of R^{52} is i-propyl or t-butyl and the group in the 6 position of R^{52} is methyl or hydrogen.

247. The compound as recited in claim 246 wherein the group in the 2 position of R^{53} is i-propyl or t-butyl and the group in 6 position of R^{52} is methyl or hydrogen.

248. A compound of the formula



(III)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

R^{15} is hydrocarbyl not containing an olefinic or acetylenic bond;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound is less than about 6;

X^- is a weakly coordinating anion.

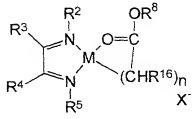
249. The compound as recited in claim 248 wherein T^1 is methyl, Z is $R^6{}_2O$ wherein each R^6 is independently alkyl, and X is BAF, SbF_6, PF_6, or BF_4.

250. The compound as recited in claim 248 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

251. The compound as recited in claim 249 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

252. The compound as recited in claim 248 wherein R^2 and R^5 are each independently hydrocarbyl provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

253. A compound of the formula



(IV)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4

taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

M is Ni(II) or Pd(II);

each R^{16} is independently hydrogen or alkyl containing 1 to 10 carbon atoms;

n is 1, 2, or 3;

X^- is a weakly coordinating anion; and

R^8 is hydrocarbyl.

254. The compound as recited in claim 253 wherein R^3 and R^4 are each independently hydrogen or methyl, both R^2 and R^5 are 2,6-diisopropylphenyl, M is Pd(II), and X is BAF, SbF_6, PF_6, or BF_4.

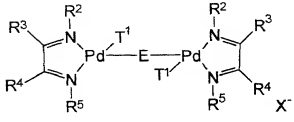
255. The compound as recited in claim 254 wherein each R^{16} is hydrogen and n is 3.

256. The compound as recited in claim 253 wherein M is Pd(II).

257. The compound as recited in claim 253 wherein each R^{16} is hydrogen and n is 3.

258. The compound as recited in claim 253 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

259. A compound of the formula



(V)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon

atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

E is halogen or $-OR^{18}$;

R^{18} is hydrocarbyl not containing olefinic or acetylenic bonds;

T^2 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds; and

X^- is a weakly coordinating anion.

260. The compound as recited in claim 259 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

261. The compound as recited in claim 259 wherein T^1 is methyl, and E is chlorine.

262. The compound as recited in claim 261 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

263. The compound as recited in claim 262 wherein X is BAF, SbF_6, PF_6, or BF_4.

264. A compound of the formula $[(\eta^4\text{-}1,5\text{-COD})PdT^1Z]^+X^-$, wherein:

T^1 is hydrocarbyl not containing olefinic or acetylenic bonds;

X^- is a weakly coordinating anion;

COD is 1,5-cyclooctadiene;

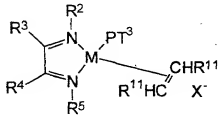
Z is $R^{10}CN$; and

R^{10} is hydrocarbyl not containing olefinic or acetylenic bonds.

265. The compound as recited in claim 264 wherein T^2 is methyl.

266. The compound as recited in claim 265 wherein Z is methyl and X is BAF, SbF_6, PF_6, or BF_4.

267. A compound of the formula



(VI)

wherein:

M is Ni(II) or Pd(II);

R^2 and R^5 are hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{11} is independently hydrogen, alkyl or $-(CH_2)_mCO_2R^1$;

T^3 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, or $-CH_2CH_2CH_2CO_2R^8$;

P is a divalent group containing one or more repeat units derived from the polymerization of one or more of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, or norbornene and, when M is Pd(II), optionally one or more of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, CO, or a vinyl ketone;

R^8 is hydrocarbyl;

m is 0 or an integer from 1 to 16;

R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

and X^- is a weakly coordinating anion.

268. The compound as recited in claim 267 wherein R^1 is hydrocarbyl or substituted hydrocarbyl.

269. The compound as recited in claim 267 wherein T^3 is hydrogen or alkyl.

270. The compound as recited in claim 267 wherein M is Pd(II).

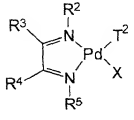
271. The compound as recited in claim 269 wherein M is Pd(II).

272. The compound as recited in claim 267 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

273. The compound as recited in claim 271 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

274. The compound as recited in claim 267 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

275. A compound of the formula



(VII)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4

taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

T^2 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, hydrocarbyl substituted with keto or ester groups but not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds; and

X is a weakly coordinating anion.

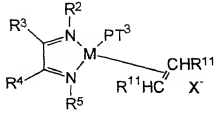
276. The compound as recited in claim 275 wherein T^2 is methyl.

277. The compound as recited in claim 276 wherein R^3 and R^4 are each independently hydrogen or methyl or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

278. The compound as recited in claim 276 wherein X is BAF, SbF_6, PF_6, or BF_4.

279. The compound as recited in claim 275 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

280. A process for the production of polyolefins, comprising, contacting, at a temperature of about -100°C to about +200°C, a compound of the formula



(VI)

with one or more monomers selected from the group consisting of ethylene, an olefin of the formula

$R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene,

wherein:

M is Ni(II) or Pd(II);

R^2 and R^5 are hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{11} is independently hydrogen, alkyl or $-(CH_2)_mCO_2R^1$;

T^3 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, or $-CH_2CH_2CH_2CO_2R^8$;

P is a divalent group containing one or more repeat units derived from the polymerization of one or monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene, and, when M is Pd(II), optionally one or more of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, CO, or a vinyl ketone;

R^8 is hydrocarbyl;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

m is 0 or an integer of 1 to 16;

and X is a weakly coordinating anion;

provided that when norbornene or substituted norbornene is present no other monomer is present;

when M is Pd a diene is not present; and

further provided that when M is Ni(II) R^{11} is not $-CO_2R^8$.

281. The compound as recited in claim 280 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and each R^{17} is hydrocarbyl.

282. The process as recited in claim 280 wherein T^3 is methyl.

283. The process as recited in claim 282 wherein said monomer is ethylene only, and R^{11} is hydrogen.

284. The process as recited in claim 282 wherein said monomer is an α-olefin only, and R^{11} is alkyl.

285. The process as recited in claim 284 wherein said α-olefin is propylene, and R^{11} is methyl.

286. The process as recited in claim 280 wherein M is Pd(II), and one or more comonomers selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

287. The process as recited in claim 286 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

288. The process as recited in claim 287 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

289. The process as recited in claim 280 done in the presence of a solvent.

290. The process as recited in claim 280 done in the absence of a solvent.

291. The process as recited in claim 282 wherein R^3 and R^4 are each independently hydrogen or methyl or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

292. The process as recited in claim 280 used to make a block polymer.

293. The process as recited in claim 280 wherein X is BAF, SbF_6, PF_6, or BF_4.

294. The process as recited in claim 291 wherein X is BAF, SbF_6, PF_6, or BF_4.

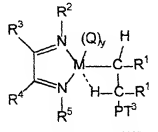
295. The process as recited in claim 294 wherein a monomer is ethylene or propylene.

296. The process as recited in claim 280 wherein the monomers are ethylene and propylene.

297. The process as recited in claim 280 wherein said monomers are part of a crude butenes stream.

298. The process as recited in claim 280 wherein said monomers comprise cyclopentene.

299. A process for the production of polyolefins, comprising, contacting, at a temperature of about -100°C to about +200°C, a compound of the formula



(XVI) $(X^-)_a$

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene,

wherein:

M is Zr, Ti, Sc, V, Cr, a rare earth metal, Fe, Co, Ni or Pd of oxidation state m;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{11} is independently hydrogen or alkyl, or both of R^{11} taken together are hydrocarbylene to form a carbocyclic ring;

T^3 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, or $-CH_2CH_2CH_2CO_2R^8$; Q is a monoanion;

P is a divalent group containing one or more repeat units derived from the polymerization of one or monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene, and, when M is Pd(II), optionally one or more of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, CO, or a vinyl ketone;

R^8 is hydrocarbyl;

a is 1 or 2;

y + a + 1 = m;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

m is 0 or an integer of 1 to 16;

and X is a weakly coordinating anion;

provided that, when norbornene or substituted norbornene is present, no other monomer is present;

when M is Pd a diene is not present; and

further provided that, when M is Ni(II), T^3 is not $-CH_2CH_2CH_2CO_2R^8$.

300. The process as recited in claim 299 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and each R^{17} is hydrocarbyl.

301. The process as recited in claim 299 wherein T^3 is methyl.

302. The process as recited in claim 301 wherein said monomer is ethylene only, and R^{11} is hydrogen.

303. The process as recited in claim 301 wherein said monomer is an α-olefin only, and R^{11} is alkyl.

304. The process as recited in claim 303 wherein said α-olefin is propylene, and each R^{11} is methyl or hydrogen.

305. The process as recited in claim 299 wherein M is Pd(II), and one or more comonomer selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

306. The process as recited in claim 305 wherein m is 0, and R^1 is hydrocarbyl or substituted hydrocarbyl.

307. The process as recited in claim 299 done in the presence of a solvent.

308. The process as recited in claim 299 done in the absence of a solvent.

309. The process as recited in claim 301 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

310. The process as recited in claim 299 used to make a block polymer.

311. The process as recited in claim 299 wherein X is BAF, SbF_6, PF_6, or BF_4.

312. The process as recited in claim 309 wherein X is BAF, SbF_6, PF_6, or BF_4.

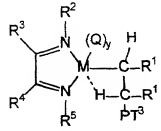
313. The process as recited in claim 312 wherein a monomer is ethylene or propylene.

314. The process as recited in claim 299 wherein the monomers are ethylene and propylene.

315. The process as recited in claim 299 wherein said monomers are part of a crude butenes stream.

316. The process as recited in claim 299 wherein said monomer comprises cyclopentene.

317. A compound of the formula



(XVI) $(X^-)_a$

wherein:

M is Zr, Ti, Sc, V, Cr, a rare earth metal, Fe, Co, Ni or Pd of oxidation state m;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{11} is independently hydrogen, or alkyl, or both of R^{11} taken together are hydrocarbylene to form a carbocyclic ring;

T^3 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, or $-CH_2CH_2CH_2CO_2R^8$;

P is a divalent group containing one or more repeat units derived from the polymerization of one or monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclopentene, cyclobutene, substituted norbornene, and norbornene, and optionally, when M is Pd(II), one or more of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, CO, or a vinyl ketone;

Q is a monovalent anion;

R^8 is hydrocarbyl;

a is 1 or 2;

y + a + 1 = m;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms;

R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

m is 0 or an integer of 1 to 16; and

and X is a weakly coordinating anion;

and provided that when M is Pd a diene is not present;.

318. The compound as recited in claim 317 wherein R^1 is hydrocarbyl or substituted hydrocarbyl.

319. The compound as recited in claim 317 wherein T^3 is hydrogen or alkyl.

320. The compound as recited in claim 317 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and each R^{17} is hydrocarbyl.

321. The compound as recited in claim 317 wherein M is Pd(II).

322. The compound as recited in claim 319 wherein M is Pd(II).

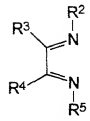
323. The compound as recited in claim 317 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

324. The compound as recited in claim 317 wherein both of R^{11} taken together form a five-membered carbocyclic ring.

325. The compound as recited in claim 317 wherein both of R^{11} taken together are hydrocarbylene to form a carbocyclic ring.

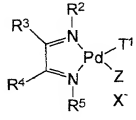
326. A process, comprising, contacting, at a temperature of about -40°C to about +60°C, a compound

of the formula $[(\eta^4\text{-}1,5\text{-COD})PdT^1Z]^+X^-$ and a diimine of the formula



(VIII)

to produce a compound of the formula



(II)

wherein:

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

X is a weakly coordinating anion;

COD is 1,5-cyclooctadiene;

Z is $R^{10}CN$;

R^{10} is hydrocarbyl not containing olefinic or acetylenic bonds;

R^{15} is hydrocarbyl not containing olefinic or acetylenic bonds;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring.

327. The process as recited in claim 326 wherein R^{10} is alkyl, and T^1 is methyl.

328. The process as recited in claim 326 carried out in a solvent of the formula $R^{10}CN$, wherein R^{10} is hydrocarbyl not containing olefinic or acetylenic bonds.

329. The process as recited in claim 327 wherein R^3 and R^4 are each independently hydrogen or methyl, and both R^2 and R^5 are 2,6-diisopropylphenyl.

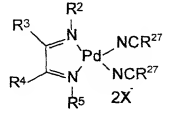
330. The process as recited in claim 326 wherein X is BAF, SbF_6, PF_6, or BF_4.

331. The process as recited in claim 326 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

332. An ethylene homopolymer with a density of 0.86 g/ml or less.

333. The ethylene homopolymer as recited in claim 332 wherein said density is about 0.85 or less.

334. A compound of the formula



(XIV)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{27} is hydrocarbyl; and

each X is a weakly coordinating anion.

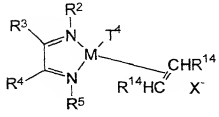
335. The compound as recited in claim 334 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

336. The compound as recited in claim 334 wherein both of R^{27} are methyl.

337. The compound as recited in claim 334 wherein R^3 and R^4 are each independently hydrogen or methyl or R^3 and R^4 taken together are 1,8-naphthylylene, and both R^2 and R^5 are 2,6-diisopropylphenyl.

338. The compound as recited in claim 334 wherein X is BAF, SbF_6, PF_6, or BF_4.

339. A compound of the formula



(IX)

wherein:

M is Ni(II) or Pd(II);

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{14} is independently hydrogen, alkyl $-(CH_2)_mCO_2R^1$;

R^1 is hydrogen, or hydrocarbyl or substitu hydrocarbyl containing 1 to 10 carbon atoms;

T^4 is alkyl, $-R^{60}C(O)OR^8$, $R^{15}(C=O)-$ or $R^{15}O($;

R^{15} is hydrocarbyl not containing olefini acetylenic bonds;

R^{60} is alkylene not containing olefinic c acetylenic bonds;

R^8 is hydrocarbyl;;

and X is a weakly coordinating anion;

and provided that when R^{14} is $-(CH_2)_mCO_2R^$ is not alkyl, M is Pd(II).

340. The compound as recited in claim 339 v R^2 and R^5 are each independently hydrocarbyl, pr that the carbon atom bound to the imino nitroge has at least two carbon atoms bound to it; and R^4 are each independently hydrogen, hydrocarbyl and R^4 taken together are hydrocarbylene to for ring.

341. The compound as recited in claim 339 T^4 is methyl and M is Pd(II).

342. The compound as recited in claim 339 each R^{14} is independently hydrogen or $-(CH_2)_mC($ is Pd(II).

343. A homopolypropylene with a glass tra temperature of -30°C or less, provided that sa homopolypropylene has at least 50 branches pe methylene groups.

344. The homopolypropylene as recited in wherein said glass transition temperature is 35°C or less.

345. A homopolymer of cyclopentene having a degree of polymerization of about 30 or more and an end of melting point of about 100°C to about 320°C, provided that said homopolymer has less than 5 mole percent of enchained linear olefin containing pentylene units.

346. The homopolymer as recited in claim 345 wherein at least 90 percent of repeat units are 1,3-cyclopentylene repeat units.

347. The homopolymer as recited in claim 345 wherein at least 90 percent of repeat units are cis-1,3-cyclopentylene repeat units.

348. The homopolymer as recited in claim 345 wherein an X-ray powder diffraction pattern thereof has reflections at approximately 17.3°, 19.3°, 24.2°, and 40.7° 2θ.

349. A homopolymer of cyclopentene that has an X-ray diffraction pattern with reflections at approximately 17.3°, 19.3°, 24.2°, and 40.7° 2θ.

350. The homopolymer as recited in claim 349 which has a monoclinic unit cell of the approximate dimensions: a=0.561 nm; b=0.607 nm; c=7.37 nm; and g=123.2°.

351. The homopolymer as recited in claim 349 wherein at least 90 percent of repeat units are 1,3-cyclopentylene repeat units.

352. The homopolymer as recited in claim 351 wherein at least 90 percent of repeat units are cis-1,3-cyclopentylene repeat units.

353. A homopolymer of cyclopentene wherein at least 90 mole percent of enchained cyclopentylene units are 1,3-cyclopentylene units, and said homopolymer has an average degree of polymerization of 30 more.

354. A homopolymer of cyclopentene wherein at least 90 mole percent of enchained cyclopentylene units are cis-1,3-cyclopentylene, and said homopolymer has an average degree of polymerization of about 10 or more.

355. A copolymer of cyclopentene and ethylene wherein at least 75 mole percent of enchained cyclopentylene units are 1,3-cyclopentylene units.

356. The copolymer as recited in claim 355 whe at least 50 mole percent of the repeat units are derived from cyclopentene.

357. The copolymer as recited in claim 355 wh there are at least 20 branches per 1000 methylene carbon atoms.

358. A copolymer of cyclopentene and ethylene wherein there are at least 20 branches per 1000 methylene carbon atoms.

359. The copolymer as recited in claim 358 wh at least 50 mole percent of the repeat units are derived from ethylene.

360. A copolymer of cyclopentene and ethylene wherein at least 50 mole percent of the repeat uni are derived from cyclopentene.

361. A copolymer comprising repeat units of cyclopentene and an α-olefin.

362. The copolymer as recited in claim 361 w repeat units derived from ethylene are also prese

363. The copolymer as recited in claim 361 w said α-olefin is a linear α-olefin.

364. The copolymer as recited in claim 361 w at least 90 mole percent of repeat units derived cyclopentene are 1,3-cyclopentylene units.

365. The copolymer as recited in claim 364 w at least 90 mole percent of repeat units derived cyclopentene are cis-1,3-cyclopentylene units.

366. A fiber made from the polymer of claim 349, 353, 354, 355, 356, 357, 358, 360 or 361.

367. A polymerization process, comprising, contacting an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, each R^{17} is independently hydrogen, hydrocarbyl, or substituted hydrocarbyl provided any olefinic bond in said olefin is separated f other olefinic bond or aromatic ring by a quate

carbon atom or at least two saturated carbon atoms with a catalyst, wherein said catalyst:

contains a nickel or palladium atom in a positive oxidation state;

contains a neutral bidentate ligand coordinated to said nickel or palladium atom, and wherein coordination to said nickel or palladium atom is through two nitrogen atoms or a nitrogen atom and a phosphorous atom; and

said neutral bidentate ligand, has an Ethylene Exchange Rate of less than 20,000 $L\text{-}mol^{-1}s^{-1}$ when said catalyst contains a palladium atom, and less than 50,000 $L\text{-}mol^{-1}s^{-1}$ when said catalyst contains a nickel atom;

and provided that when M is Pd a diene is not present.

368. The polymerization process as recited in claim 367 wherein said Ethylene Exchange Rate is less than 10,000 $L\text{-}mol^{-1}s^{-1}$ when said catalyst contains a palladium atom, and less than 25,000 $L\text{-}mol^{-1}s^{-1}$ when said catalyst contains a nickel atom.

369. The process as recited in claim 367 wherein said bidentate ligand is coordinated to said nickel or palladium atom through two nitrogen atoms.

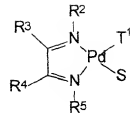
370. The process as recited in claim 369 wherein said ligand is an α-diimine.

371. The process as recited in claim 367 wherein said olefin has the formula $R^{17}CH=CH_2$, wherein R^{17} is hydrogen or n-alkyl.

372. A process for the polymerization of olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

a first compound which is a source of a relatively noncoordinating monoanion;

a second compound of the formula



(XX)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, or norbornene;

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that R^{17} does not contain any olefinic bonds;

T^1 is hydrogen, hydrocarbyl not containing olefinic or acetylenic bonds, $R^{15}C(=O)-$ or $R^{15}OC(=O)-$;

S is chloride, iodide, or bromide; and

provided that, when norbornene or substituted norbornene is present, no other monomer is present.

373. The process as recited in claim 372 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and each R^{17} is saturated hydrocarbyl.

374. The process as recited in claim 372 wherein said source is an alkali metal salt of said anion.

375. The process as recited in claim 372 wherein T^1 is methyl.

376. The process as recited in claim 372 wherein said monomer is ethylene only, and R^{11} is hydrogen.

377. The process as recited in claim 372 wherein one or more comonomer selected from the group consisting of: a compound of the formula $CH_2=CH(CH_2)_mCO_2R^1$, wherein R^1 is hydrogen or, hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms, and m is 0 or an integer of 1 to 16; CO; and a vinyl ketone is also present.

378. The process as recited in claim 372 done in the presence of a solvent.

379. The process as recited in claim 368 used to make a block polymer.

380. The process as recited in claim 368 wherein said monoanion is BAF, SbF_6, PF_6, or BF_4.

381. The process as recited in claim 374 wherein said monoanion is BAF^-, SbF_6^-, PF_6^-, or BF_4^-.

382. The process as recited in claim 377 wherein a monomer is ethylene or propylene.

383. The process as recited in claim 372 wherein the monomers are ethylene and propylene.

384. A polyolefin, comprising, a polymer made by polymerizing one or more monomers of the formula $H_2C=CH(CH_2)_eG$ by contacting said monomers with a transition metal containing coordination polymerization catalyst, wherein:

each G is independently hydrogen or $-CO_2R^1$;

each e is independently 0 or an integer of 1 to 20;

each R^1 is independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

and provided that:

said polymer has at least 50 branches per 1000 methylene groups;

in at least 50 mole percent of said monomers G is hydrogen;

except when no branches should be theoretically present, the number of branches per 1000 methylene groups is 90% or less than the number of theoretical branches per 1000 methylene groups, or the number of branches per 1000 methylene groups is 110% or more of theoretical branches per 1000 methylene groups; and

when there should be no branches theoretically present, said polyolefin has 50 or more branches per 1000 methylene groups;

and provided that said polyolefin has at least two branches of different lengths containing less than 6 carbon atoms each.

385. The polyolefin as recited in claim 384 wherein except when no branches should be theoretically present the number of branches per 1000 methylene groups is 80% or less than the number of theoretical branches per 1000 methylene groups, or the number of branches per 1000 methylene groups is 120% or more of theoretical branches per 1000 methylene groups; and

when there should be no branches theoretically present, said polyolefin has 75 or more branches per 1000 methylene groups.

386. A polyolefin, comprising, a polymer made by polymerizing one or more monomers of the formula $H_2C=CH(CH_2)_eG$ by contacting said monomers with a transition metal containing coordination polymerization catalyst, wherein:

each G is independently hydrogen or $-CO_2R^1$;

each e is independently 0 or an integer of 1 to 20;

R^1 is independently hydrogen, hydrocarbyl or substituted hydrocarbyl;

and provided that:

said polymer has at least 50 branches per 1000 methylene groups;

in at least 50 mole percent of said monomers G is hydrogen;

said polymer has at least 50 branches of the formula $-(CH_2)_fG$ per 1000 methylene groups, wherein when G is the same as in a monomer and e≠f, and/or for any single monomer of the formula $H_2C=CH(CH_2)_eG$ there are less than 90% of the number of theoretical branches per 1000 methylene groups, or more than 110% of the theoretical branches per 1000 methylene groups of the formula $-(CH_2)_fG$ and f=e, and wherein f is 0 or an integer of 1 or more;

and provided that said polyolefin has at least two branches of different lengths containing less than 6 carbon atoms each.

387. The polyolefin as recited in claim 386 wherein when G is the same as in a monomer and e≠f, and/or for any single monomer of the formula $H_2C=CH(CH_2)_eG$ there are less than 80% of the number of theoretical branches per 1000 methylene groups, or more than 120% of the theoretical branches per 1000 methylene groups of the formula $-(CH_2)_fG$ and f=e.

388. A tackifier for an adhesive comprising the polymer of claim 1, 2, 3, 5, 6 or 7.

389. An oil additive for smoke suppression in two-stroke gasoline engines comprising the polymer of claim 1, 2, 3, 4, 5, 6, or 7.

390. A base resin for a hot melt adhesive, a pressure sensitive adhesive or a solvent applied adhesive comprising the polymer of claim 1, 2, 3, 4, 5, 6 or 7.

391. A viscosity modifier for lubricating oils comprising the polymer of claim 1, 2, 3, 4, 5, 6 or 7.

392. A coating or penetrant comprising the polymer of claim 1, 2, 4, 5, 6 or 7.

393. A base polymer for caulking comprising the polymer of claim 1, 2, 3, 4, 5, 6 or 7.

394. The polymer of claim 1, 2, 4, 5, 6 or 7 which is grafted so it contains functional groups.

395. A toughener for a thermoplastic or a thermoset comprising the polymer of claim 14.

396. A modifier for asphalt comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

397. The polymer of claim 1, 3, 4, 6, 7, 332 or 343 which is chlorinated or chlorosulfonated.

398. The polymer of claim 17 which is elastomeric.

399. A wire insulation or jacketing comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

400. A toughener for polyolefins comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

401. A base for a synthetic lubricant comprising the polymer of claim 1, 4, 6, 7, 332 or 343.

402. A drip suppressant for synthetic polymers comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

403. A blown or cast film, or a sheet comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

404. An additive for wax candles for smoke suppression or drip control comprising the polymer of claim 1, 4, 6, 7, 332 or 343.

405. A base resin for carpet backing comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

406. A capliner resin comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

407. A thermal transfer imaging resin comprising the polymer of claim 1, 4, 6, 7, 332 or 343.

408. An extrusion or coextrusion onto a plastic, metal, textile or paper web comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

409. A laminating adhesive for glass comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

410. A foamed object comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

411. A powder used to coat an object comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

412. A hose comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

413. A pour point depressant for a fuel or oil comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

414. A nonwoven fabric comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

415. A roofing membrane comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

416. A reactive diluent for an automotive finish comprising the polymer of claim 7, 8, 9, 10, 11 or 12.

417. An ionomer comprising the polymer of claim 7, 8, 9, 10, 11 or 12.

418. A molding resin comprising the ionomer of claim 417.

419. A core for the initiation of condensation polymerizations yielding a grafted branched polymer, comprising the polymer of claim 7, 8, 9, 10, 11, or 12.

420. A compatiblizing agent comprising the polymer of claim 3, 6 or 7.

421. A toughener for a thermoplastic or thermoset comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

422. An internal plasticizer for polymers comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

423. An adhesive for adhering a polymer comprising the polymer of claim 3, 6, 7, 332 or 343.

424. A curing agent for a polymer containing complimentary functional groups comprising the polymer of claim 3, 6 or 7.

425. An additive to thermoplastic polymers to improve the adhesion of paint thereto comprising the polymer of claim 3, 6 or 7.

426. A polymer blend comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343 and at least one other polymer.

427. A polymer of one or more alpha-olefins of the formula $CH_2=CH(CH_2)_aH$ wherein a is an integer of 2 or more, which contains the structure

(XXV)

wherein R^{35} is an alkyl group and R^{36} is an alkyl group containing two or more carbon atoms, and provided that R^{35} is methyl in at least about 2 mole percent of the total amount of (XXV) in said polymer.

428. The polymer as recited in claim 427 wherein a structure in which R^{35} is methyl is about 5 mole percent or more of the total amount of (XXV) in said polymer.

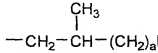
429. The polymer as recited in claim 427 wherein a structure in which R^{35} is methyl is about 50 mole percent or more of the total amount of (XXV) in said polymer.

430. A polymer of one or more alpha-olefins of the formula $CH_2=CH(CH_2)_aH$ wherein a is an integer of 2 or more, wherein said polymer contains methyl branches and said methyl branches are about 25 to about 75 mole percent of the total branches in said polymer.

431. The polymer as recited in claim 430 which contains branches of the formula $-(CH_2)_aH$.

432. The polymer as recited in claim 430 which contains branches of the formula $-(CH_2)_nH$ wherein n is an integer of 6 or greater.

433. The polymer as recited in claim 431 which contains the structure



(XXVI)

and wherein (XXVI) is present in an amount of 0.5 branches of (XXVI) or more per 1000 methylene atoms greater than can be accounted for by end groups.

434. A polyethylene containing the structure (XXVII) in an amount greater than can be accounted for by end groups.

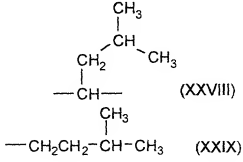
(XXVII)

435. The polyethylene as recited in claim 434 which contains about 2 or more of (XXVII) per 1000 methylene groups in said polymer.

436. A polypropylene containing one or both of the structures (XXVIII) and (XXIX), provided that:

(XXIX), if present is present in an amount greater than or equal to 0.5 of (XXIX) per 1000 methylene groups greater than can be accounted for by end groups;

or the polymer contains at least 0.5 or more of (XXVIII) per 1000 methylene groups, if (XXVIII) is present.



(XXVIII)

(XXIX)

437. The polypropylene as recited in claim 436 which contains about 15 or more groups of structure (XXVIII) per 1000 methylene groups in said polypropylene.

438. The polypropylene as recited in claim 436 which contains about 15 or more groups of structure (XXIX) per 1000 methylene groups in said polypropylene.

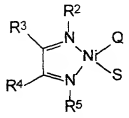
439. A process for the formation of linear α-olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

ethylene;

a first compound W, which is a neutral Lewis acid capable of abstracting X^- to form WX^-, provided that the anion formed is a weakly coordinating anion, or a

cationic Lewis or Bronsted acid whose counterion is a weakly coordinating anion; and

a second compound of the formula



(XXXI)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl;

R^3 and R^4 are each independently hydrogen, substituted hydrocarbyl, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring; and

Q and S are each independently chlorine, bromine, iodine or alkyl; and

wherein an α-olefin containing 4 to 40 carbon atoms is produced.

440. The process as recited in claim 439 wherein said linear α-olefin has the formula $H_2C=CHR^1$, wherein R^1 is n-alkyl containing 2 to 30 carbon atoms.

441. The process as recited in claim 439 wherein R^2 and R^5 are phenyl.

442. The process as recited in claim 439 wherein R^3 and R^4 are hydrogen, methyl or 1,8-naphthylylene.

443. The process as recited in claim 440 wherein R^3 and R^4 are hydrogen, methyl or 1,8-naphthylylene.

444. The process as recited in claim 439 wherein said second compound is an alkyl aluminum compound.

445. The process as recited in claim 444 wherein said alkyl aluminum compound is R^9_3Al, R^9_2AlCl, R^9AlCl_2, $R^9_3Al_2Cl_3$, or R^9AlO, wherein R^9 is alkyl containing 1 to 25 carbon atoms.

446. The process as recited in claim 445 wherein R^9 contains 1 to 4 carbon atoms.

447. The process as recited in claim 443 wherein said second compound is R^9_3Al, R^9_2AlCl, R^9AlCl_2, or R^9AlO, $R^9_3Al_2Cl_3$, wherein R^9 is alkyl containing 1 to 25 carbon atoms.

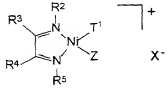
448. The process as recited in claim 439 carried out at a temperature of about 25°C to about 100°C.

449. The process as recited in claim 439 wherein a partial pressure of said ethylene is about atmospheric pressure to about 275 MPa.

450. The process as recited in claim 439 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

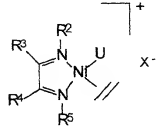
451. A process for the formation of linear α-olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

ethylene and a compound of the formula



(III)

or



(XXXIV)

wherein:

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl;

R^3 and R^4 are each independently hydrogen, substituted hydrocarbyl, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

T^1 is hydrogen or n-alkyl containing up to 38 carbon atoms;

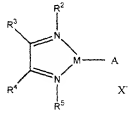
Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur, or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound (measured in water) is less than about 6;

U is n-alkyl containing up to 38 carbon atoms; and

X is a noncoordinating anion;

and wherein an α-olefin containing 4 to 40 carbon atoms is produced.

452. A process for the production of polyolefins, comprising, contacting, at a temperature of about 0°C to about +200°C, a compound of the formula



XXXVII

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene,

wherein:

M is Ni(II) or Pd(II);

A is a π-allyl or π-benzyl group;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom

bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms; R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

and X is a weakly coordinating anion;

and provided that;

when norbornene or substituted norbornene is present, no other monomer is present; and

when M is Pd a diene is not present.

453. The process as recited in claim 452 wherein said temperature is about 20°C to about 100°C.

454. The process as recited in claim 452 wherein said olefin is ethylene or a linear α-olefin.

455. The process as recited in claim 452 wherein said olefin is ethylene.

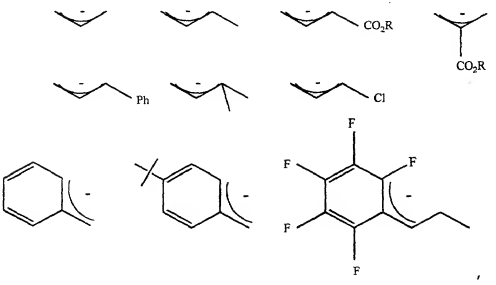
456. The process as recited in claim 452 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

457. The process as recited in claim 452 or 454 wherein a Lewis acid is also present.

458. The process as recited in claim 452 wherein M is Ni(II).

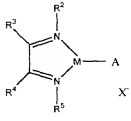
459. The process as recited in claim 452 wherein M is PD(II).

460. The process as recited in claim 452 wherein said π-allyl or π-benzyl group is selected from the group consisting of



wherein R is hydrocarbyl.

461. A compound of the formula



XXXVII

wherein:

M is Ni(II) or Pd(II);

A is a π-allyl or π-benzyl group;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

each R^{17} is independently hydrocarbyl or substituted hydrocarbyl provided that any olefinic bond in said olefin is separated from any other olefinic

bond or aromatic ring by a quaternary carbon atom or at least two saturated carbon atoms; R^1 is hydrogen, or hydrocarbyl or substituted hydrocarbyl containing 1 to 10 carbon atoms;

and X is a weakly coordinating anion;

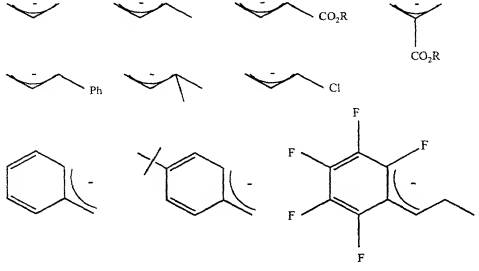
and provided that when M is Pd a diene is not present.

462. The compound as recited in claim 461 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

463. The compound as recited in claim 461 wherein M is Ni(II).

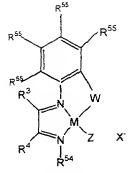
464. The compound as recited in claim 461 wherein M is Pd(II).

465. The compound as recited in claim 461 wherein said π-allyl or π-benzyl group is selected from the group consisting of



wherein R is hydrocarbyl.

466. A compound of the formula



(XXXVIII)

wherein:

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

R^{54} is hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

each R^{55} is independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or a functional group;

W is alkylene or substituted alkylene containing 2 or more carbon atoms;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur, or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound (measured in water) is less than about 6, or an olefin of the formula $R^{17}CH=CHR^{17}$;

each R^{17} is independently hydrogen, saturated hydrocarbyl or substituted saturated hydrocarbyl; and

X is a weakly coordinating anion;

and provided that when M is Ni, W is alkylene and each R^{17} is independently hydrogen or saturated hydrocarbyl.

467. The compound as recited in claim 466 wherein R^3 and R^4 are each independently hydrogen or

hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and R^{54} is hydrocarbyl.

468. The compound as recited in claim 466 or 467 wherein each R^{55} is independently hydrogen or alkyl containing 1 to 10 carbon atoms.

469. The compound as recited in claim 466 wherein Z is neutral Lewis base.

470. The compound as recited in claim 469 wherein Z is a dialkyl ether.

471. The compound as recited in claim 466 wherein Z is $R^{17}CH=CHR^{17}$.

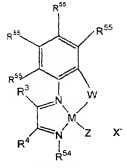
472. The compound as recited in claim 471 wherein each R^{17} is independently hydrogen or alkyl.

473. The compound as recited in claim 471 wherein both of R^{17} are hydrogen.

474. The compound as recited in claim 466 wherein W is $-CH(CH_3)CH_2-$ or $-C(CH_3)_2CH_2-$.

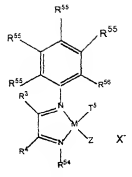
475. The compound as recited in claim 471 wherein W is a divalent polymeric radical derived from the polymerization of $R^{17}CH=CHR^{17}$.

476. A process for the production of a compound of the formula



(XXXVIII)

comprising, heating a compound of the formula



(XXXIX)

at a temperature of about -30°C to about +100° for a sufficient time to produce (XXXVIII), and wherein:

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

R^{54} is hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

each R^{55} is independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or a functional group;

R^{56} is alkyl containing 2 to 30 carbon atoms;

T^5 is alkyl;

W is alkylene containing 2 to 30 carbon atoms;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur, or oxygen, provided that if the donating atom is nitrogen then the pKa of the conjugate acid of that compound (measured in water) is less than about 6; and

X is a weakly coordinating anion.

477. The process as recited in claim 476 wherein R^3 and R^4 are each independently hydrogen or hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and R^{54} is hydrocarbyl.

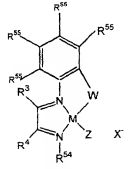
478. The process as recited in claim 476 or 472 wherein each R^{55} is independently hydrogen or alkyl containing 1 to 10 carbon atoms.

479. The process as recited in claim 476 wherein Z is a dialkyl ether.

480. The process as recited in claim 476 wherein W is $-CH(CH_3)CH_2-$ or $-C(CH_3)_2CH_2-$

481. The process as recited in claim 476, 477, 479 or 480 wherein T^5 is methyl.

482. A process for the polymerization of olefins, comprising, contacting a compound of the formula



(XXXVIII)

and one or more monomers selected from the group consisting of ethylene, an olefin of the formula $R^{17}CH=CH_2$ or $R^{17}CH=CHR^{17}$, cyclobutene, cyclopentene, substituted norbornene, and norbornene,

wherein:

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring;

R^{54} is hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound directly to the imino nitrogen atom has at least two carbon atoms bound to it;

each R^{55} is independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or a functional group;

W is alkylene or substituted alkylene containing 2 or more carbon atoms;

Z is a neutral Lewis base wherein the donating atom is nitrogen, sulfur, or oxygen, provided that if the donating atom is nitrogen then the pKa of the

conjugate acid of that compound (measured in water) is less than about 6, or an olefin of the formula $R^{17}CH=CHR^{17}$;

each R^{17} is independently hydrogen, saturated hydrocarbyl or substituted saturated hydrocarbyl; and

X is a weakly coordinating anion;

and provided that:

when M is Ni, W is alkylene and each R^{17} is independently hydrogen or saturated hydrocarbyl;

and when norbornene or substituted norbornene is present, no other monomer is present.483. The process as recited in claim 482 wherein R^3 and R^4 are each independently hydrogen or hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring; and R^{54} is hydrocarbyl.

484. The process as recited in claim 482 or 483 wherein each R^{55} is independently hydrogen or alkyl containing 1 to 10 carbon atoms.

485. The process as recited in claim 482 wherein Z is a dialkyl ether.

486. The process as recited in claim 482 wherein Z is $R^{17}CH=CHR^{17}$.

487. The process as recited in claim 482 wherein each R^{17} is independently saturated hydrocarbyl or hydrogen.

488. The process as recited in claim 482 wherein both of R^{17} are hydrogen.

489. The process as recited in claim 482 wherein W is $-CH(CH_3)CH_2-$ or $-C(CH_3)_2CH_2-$.

490. The process as recited in claim 482 wherein said temperature is about 20°C to about 100°C.

491. The process as recited in claim 482 wherein said olefin is ethylene or a linear α-olefin.

492. The process as recited in claim 482 wherein said olefin is ethylene, propylene or a combination of ethylene and propylene.

493. The process as recited in claim 486 wherein said olefin is ethylene, propylene or a combination of ethylene and propylene.

494. The process as recited in claim 489 wherein said olefin is cyclopentene.

495. The process as recited in claim 482 wherein said olefin is cyclopentene.

496. A homopolypropylene containing about 10 to about 700 $\Delta+$ methylene groups per 1000 methylene groups.

497. The homopolypropylene as recited in claim 496 containing about 25 to about 300 $\delta+$ methylene groups per 1000 methylene groups.

498. A homopolypropylene wherein a ratio of $\delta+:\gamma$ methylene groups is about 0.5 to about 7.

499. The homopolypropylene as recited in claim 498 wherein said ratio is about 0.7 to 2.0.

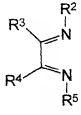
500. A homopolypropylene in which about 30 to about 85 mole percent of monomer units are enchained in an $\omega,1$ fashion.

501. The homopolypropylene as recited in claim 500 wherein about 30 to about 60 mole percent of the monomer units are enchained in an $\omega,1$ fashion.

502. A process for the formation of linear α-olefins, comprising, contacting, at a temperature of about -100°C to about +200°C:

ethylene;

and a Ni[II] of



(VIII)

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom

bound to the imino nitrogen atom has at least two carbon atoms bound to it;

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a carbocyclic ring and

wherein an α-olefin containing 4 to 40 carbon atoms is produced.

503. The process as recited in claim 502 wherein said linear α-olefin has the formula $H_2C=CHR^1$, wherein R^1 is n-alkyl containing 2 to 30 carbon atoms.

504. The process as recited in claim 502 wherein R^2 and R^5 are phenyl.

505. The process as recited in claim 502 wherein R^3 and R^4 are hydrogen, methyl or 1,8-naphthylylene.

506. The process as recited in claim 503 wherein R^3 and R^4 are hydrogen, methyl or 1,8-naphthylylene.

507. The process as recited in claim 502 carried out at a temperature of about 25°C to about 100°C.

508. The process as recited in claim 502 wherein a partial pressure of said ethylene is about atmospheric pressure to about 275 MPa.

509. The process as recited in claim 502 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

510. A polymer blend comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 and one other polymer.

511. A nonwoven fabric wherein at least some fibers comprise the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

512. A shaped part comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

513. A sheet or film comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

514. A nonwoven fabric or microfiber comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

515. A laminate wherein one or more of the layers comprises the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

516. The laminate as recited in claim 511 wherein a barrier layer is present.

517. A fiber comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

518. A foam or foamed object comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

519. A microporous membrane comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361.

520. The polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 which is crosslinked.

521. The polymer of claim 345, 349, 353, 354, or 355 which is heat treated.

522. The polymer as recited in claim 521 which has 20 percent or more crystallinity.

523. A composition comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 and a nucleating agent.

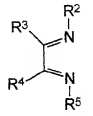
524. A composition comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 and a flame ratardant.

525. A composition comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 and an antioxidant.

526. A composition comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 and a filler or reinforcer.

527. A composition comprising the polymer of claim 345, 349, 353, 354, 355, 358, 360 or 361 which is electrically conductive.

528. A process, comprising, contacting, at a temperature of about -80°C to about +20°C, a compound of the formula $(\eta^4\text{-}1,5\text{-COD})PdMe_2$ and a diimine of the formula



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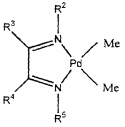
to produce a compound of the formula



(XXXXI)

wherein:

COD is 1,5-cyclooctadiene;

R^2 and R^5 are each independently hydrocarbyl or substituted hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and

R^3 and R^4 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or R^3 and R^4 taken together are hydrocarbylene or substituted hydrocarbylene to form a ring.

529. The process as recited in claim 528 wherein said temperature is about -50°C to about +10°C.

530. The process as recited in claim 528 wherein R^2 and R^5 are both 2-t-butylphenyl or 2,5-di-t-butylphenyl, and R^3 and R^4 taken together are 1,8-

naphthylylene, or R^3 and R^4 are both hydrogen or methyl.

531. The process as recited in claim 528 wherein R^2 and R^5 are each independently hydrocarbyl, provided that the carbon atom bound to the imino nitrogen atom has at least two carbon atoms bound to it; and R^3 and R^4 are each independently hydrogen, hydrocarbyl, or R^3 and R^4 taken together are hydrocarbylene to form a ring.

532. The compound as recited in claim 232, 248, 253, 259, 267, 317, 334, 339, 461 or 466 wherein X is part of a heterogeneous support.

533. The compound as recited in claim 532 wherein said heterogeneous support is montmorillonite.

534. The process as recited in claim 49, 97, 176, 199, 280, 299, 451, 452 or 482 wherein X is part of a heterogeneous support.

535. The process as recited in claim 49, 97, 176, 199, 280, 299, 451, 452 or 482 wherein a polymerization catalyst is supported on a heterogeneous support.

536. The compound as recited in claim 232, 248, 253, 259, 267, 317, 334, 339, 461 or 466 which is supported on a heterogeneous support.

537. The process as recited in claim 49, 97, 176, 199, 280, 299, 451, 452 or 482 wherein the polymerization is run in the gas phase.

538. The process as recited in claim 478 which is run in a fluidized bed reactor.

539. A flexible pouch made from a single or multilayer film which comprises the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

540. The polymer of claim 1, 3, 4, 6, 332 or 343 grafted with a compound containing ethylenic unsaturation and a functional group.

541. The polymer as recited in claim 540 wherein said functional group is carboxyl, carboxylic anhydride, ester or a carboxylate salt.

542. A wrap packaging film having differential cling, comprising a film laminate having at least two layers;

an outer reverse layer which comprises a polymer of claim 1, 3, 4, 6, 7, 332 or 343, and a tackifier present in sufficent amount to impart cling properties; and

an outer obverse layer which has a density of at least about 0.916 g/mL and which has little or no cling; and

provided that a density of said outer reverse layer is at least 0.008 g/mL less than that of a density of said outer obverse layer.

543. A fine denier fiber comprising the polymer of claim 1, 3, 4, 6, 7, 332 or 343.

544. A composition, comprising, a polymer of claim 1, 3, 4, 6, 7, 332 or 343 and an antifogging agent.

545. The process as recited in claim 13, 15 or 142 wherein said bidentate ligand or second compound is (XXX) and n is 2, all of R^{30}, R^{28} and R^{29} are hydrogen, and both of R^{44} and R^{45} are 9-anthracenyl.

546. The process as recited in claim 65 or 84 wherein said compound or said second compound is (XVII) and n is 2, all of R^{30}, R^{28} and R^{29} are hydrogen, and both of R^{44} and R^{45} are 9-anthracenyl.

547. The process as recited in claim 65 or 84 wherein said compound or said second compound is (XVII) and n is 2, all of R^{30}, R^{28} and R^{29} are hydrogen, both of R^{44} and R^{45} are 9-anthracenyl, M is Ni, and n is 2.

548. The compound or process as recited in claim 299 or 317 wherein M is Ni or Pd and m is 2.

549. The process as recited in claim 299 wherein M is Ni.

550. The process as recited in claim 49 wherein said olefin comprises cyclopentene.

551. The process as recited in claim 65 wherein said olefin comprises cyclopentene.

552. The process as recited in claim 452 wherein said olefin comprises cyclopentene.

553. The process as recited in claim 548 wherein said monomer comprises cyclopentene.

554. The process as recited in claim 17, 48, 124, 151, 156, 167, 180, 231, 298, 316, 550, 551, 552 or 553 wherein cyclopentene is a solvent.

555. The process as recited in claim 37 wherein:

R^2 and R^5 are both 2,4,6-trimethylphenyl or 2,6-dimethylphenyl;

R^3 and R^4 taken together are 1,8-naphthylylene;

y and z are both 1;

M is Ni;

Q and S are both chloride, iodide or bromide; and

m is 2.

556. The process as recited in claim 555 wherein said first compound is an alkylaluminum compound.

557. The process as recited in claim 556 wherein said alkylaluminum compound is ethylaluminum dichloride or methylaluminoxane.

558. The process as recited in claim 555, 556 or 557 wherein said monomer comprises cyclopentene.

559. The process as recited in claim 558 wherein cyclopentene is a solvent.

560. The polymer as recited in claim 1, 3, 4, 6, 332 or 343 which has:

a melt flow ratio, $I10/I2 \geq 5.63$;

a molecular weight distribution, Mw/Mn, defined by the equation: $Mw/Mn \leq (I10/I2)-4.63$; and

a critical shear rate at onset of surface melt fracture of at least 50 percent greater than the critical shear rate at the onset of surface melt fracture of a linear olefin polymer having about the same I2 and Mw/Mn.

561. A composition comprising:

the polymer as recited in claim 1, 3, 4, 6, 332 or 343 which has:

a melt flow ratio, I10/I2, > or = 5.63;

a molecular weight distribution, Mw/Mn, defined by the equation: Mw/Mn < OR = (I10/I2)-4.63; and

a critical shear rate at onset of surface melt fracture of at least 50 percent greater than the critical shear rate at the onset of surface melt fracture of a linear olefin polymer having about the same I2 and Mw/Mn; and

at least one other: natural polymer; a synthetic polymer chosen from the polymer of claims 1, 3, 4, 6, 332, or 343; or a conventional high density polyethylene, low density polyethylene or linear low density polyethylene polymer.

562. The polymer as recited in claim 1, 3, 4, 6, 332, 343, 383, 384, 385, 386 or 387 which has a melt flow ratio, I10/I2 ≥ 5.63, a molecular weight distribution, Mw/Mn, defined by the equation: Mw/Mn ≤ (I10/I2)-4.63, and a critical shear stress at onset of gross melt fracture of greater than about 400 kPa.